Name _____ Date _____ Class _____

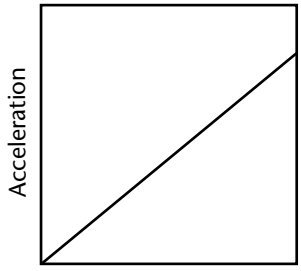
Net Force, Mass, and Change in Motion

Unbalanced forces cause a change in an object's motion. The net force acting on the object causes it to speed up, slow down, or change direction. Changes in motion, that is, speeding up, slowing down, or changing direction, are called acceleration. When an object of a certain mass is acted upon by a net force, the amount of change in the object's motion (its acceleration) is proportional to the size of the net force.

When two values are proportional, an increase in one causes the other value to increase or decrease. These relationships between proportional values are often seen in the natural world. For this reason, they have special names.

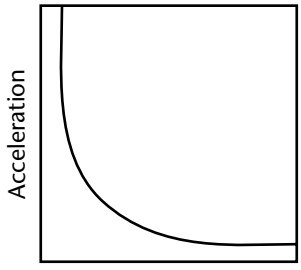
Directly proportional: When the net force increases, the change in motion for an object of certain mass increases. Any two values that increase or decrease in the same way are directly proportional. Figure 1 shows a graph of this relationship.

Figure 1



Inversely proportional: Whenever an increase in one value results in a decrease in another value (and vice versa), the two values are inversely proportional. Figure 2 shows an inverse relationship for the amount of change in motion and mass.

Figure 2



Look at the table below that shows how net force, mass, and the change in motion are related.

If acceleration is:	and mass is:	force must be:
1 m/s^2	0.1 kg	0.1 N
1 m/s^2	0.2 kg	0.2 N
1 m/s^2	0.5 kg	0.5 kg
1 m/s^2	0.7 kg	0.7 N
1 m/s^2	1.0 kg	1.0 N

1. On graph paper, plot each pair of values for mass and force from the table. Let the horizontal axis represent mass, and the vertical axis represent force. Connect the points with lines.
2. When acceleration is held constant and objects of different mass are observed, are mass and force directly proportional or inversely proportional? Explain.
3. You are in a room with only one light bulb lit. As you approach the light, it appears brighter. As you move away, it appears dimmer. Are the brightness and distance from the bulb directly proportional or inversely proportional?